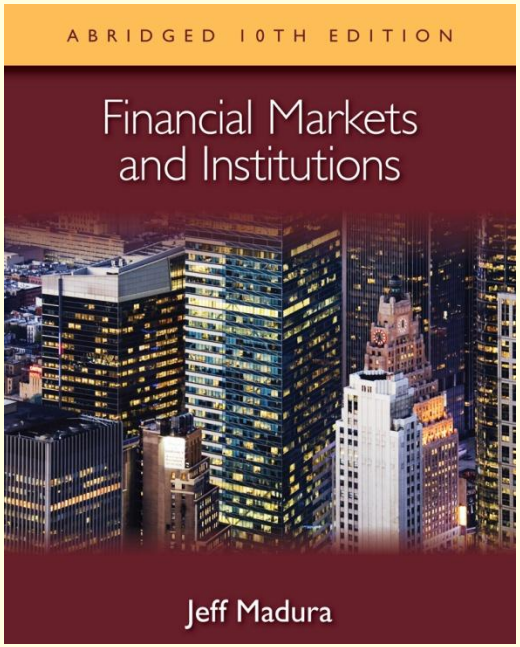
Financial Markets and Institutions

Abridged 10th Edition

by Jeff Madura



14 Options Markets

Chapter Objectives

- provide a background on options
- explain why stock option premiums vary
- explain how stock options are used to speculate
- explain how stock options are used to hedge
- explain the use of stock index options
- explain the use of options on futures

Background on Options

Call Option: right to buy underlying financial instrument at exercise price (or strike price) within a specified period of time.

- **In the money** when market price > exercise price
- **At the money** when market price = exercise price
- **Out of the money** when market price < exercise price

Put Option: right to sell underlying financial instrument at exercise price (or strike price) within a specified period of time.

- **In the money** when market price < exercise price
- **At the money** when market price = exercise price
- **Out of the money** when market price > exercise price

Background on Options

Comparison of Options and Futures

- To obtain an option, a premium must be paid in addition to the price of the financial instrument.
- The owner of an option can choose to let the option expire on the expiration date without exercising it.

Institutional Use of Options

- Although options positions are sometimes taken by financial institutions for speculative purposes, they are more commonly used for hedging.

Exhibit 14.1 Institutional Use of Options Markets

TYPE OF FINANCIAL INSTITUTION	PARTICIPATION IN OPTIONS MARKETS
Commercial banks	• Sometimes offer options to businesses.
Savings institutions	• Sometimes take positions in options on futures contracts to hedge interest rate risk
Mutual funds	• Stock mutual funds take positions in stock index options to hedge against a possible decline in prices of stocks in their portfolios. • Stock mutual funds sometimes take speculative positions in stock index options in an attempt to increase their returns. • Bond mutual funds sometimes take positions in options on futures to hedge interest rate risk.
Securities firms	• Serve as brokers by executing stock option transactions for individuals and businesses.
Pension funds	• Take positions in stock index options to hedge against a possible decline in prices of stocks in their portfolio. • Take positions in options on futures contracts to hedge their bond portfolios against interest rate movements.
Insurance companies	• Take positions in stock index options to hedge against a possible decline in prices of stocks in their portfolio. • Take positions in options on futures contracts to hedge their bond portfolios against interest rate movements.

Background on Options

Markets Used to Trade Options

The Chicago Board Options Exchange (CBOE), created in 1973, is the most important exchange for trading options.

Options are also traded at the CME Group.

As the popularity of stock options increased, various stock exchanges began to list options.

- **Listing Requirements -** One key requirement is a minimum trading volume of the underlying stock.
- **Role of the Options Clearing Corporation -** serves as a guarantor on option contracts traded in the United States.
- **Regulation of Options Trading** – SEC and others.

Background on Options

How Option Trades Are Executed

- Computer technology allows investors to have trades executed electronically.
- Market-makers can execute stock option transactions for customers.

Types of Orders

- An investor can use either a market order or a limit order for an option transaction.
- Online Trading - Option contracts can also be purchased or sold online.

Stock Option Quotations (Exhibit 14.2)

Exhibit 14.2 Viperon Company Stock Option Quotations

	STRIKE	EXP.	VOLUME	CALL	VOLUME	PUT
Option 1	45	Jun	180	4½	60	2¾
Option 2	45	Oct	70	5¾	120	3¾
Option 3	50	Jun	360	1⅛	40	5⅛
Option 4	50	Oct	90	3½	40	6½

Determinants of Stock Option Premiums

Determinants of Call Option Premiums

1. **Influence of the Market Price -** The higher the existing market price of the underlying financial instrument relative to the exercise price, the higher the call option premium, other things being equal.
2. **Influence of the Stock's Volatility -** The greater the volatility of the underlying stock, the higher the call option premium, other things being equal.
3. **Influence of the Call Option's Time to Maturity -** The longer the call option's time to maturity, the higher the call option premium, other things being equal

Exhibit 14.3 Relationship between Exercise Price and Call Option Premium on KSR Stock

EXERCISE PRICE	PREMIUM FOR APRIL EXPIRATION DATE
$130	11⅝
135	7½
140	5¼
145	3¼
150	1⅞

Exhibit 14.4 Relationship between Time to Maturity and Call Option Premium on KSR Stock

EXPIRATION DATE	PREMIUM FOR OPTION WITH A $135 EXERCISE PRICE
March	4½
April	7½
July	13¼

Determinants of Stock Option Premiums

Determinants of Put Option Premiums

1. **Influence of the Market Price -** The higher the existing market price of the underlying stock relative to the exercise price, the lower the put option premium, other things being equal.
2. **Influence of the Stock's Volatility -** The greater the volatility of the underlying stock, the higher the put option premium, other things being equal.
3. **Influence of the Put Option's Time to Maturity -** The longer the time to maturity, the higher the put option premium, other things being equal

Exhibit 14.5 Relationship between Exercise Price and Put Option Premium on KSR Stock

EXERCISE PRICE	PREMIUM FOR JUNE EXPIRATION DATE
$130	1⅞
135	3⅛
140	5⅜
145	8½
150	12¼

Exhibit 14.6 Relationship between Time to Maturity and Put Option Premium on KSR Stock

EXPIRATION DATE	PREMIUM FOR OPTION WITH A $135 EXERCISE PRICE
March	½
April	3⅛
July	7¼

Determinants of Stock Option Premiums

How Option Pricing Can Be Used to Derive a Stock's Volatility

- Some investors assess a specific stock's risk by using the option-pricing formula to estimate the stock's anticipated volatility.
- By using the prevailing option premium and values for the other factors in the option-pricing formula, the **implied volatility** or **implied standard deviation** can be estimated.

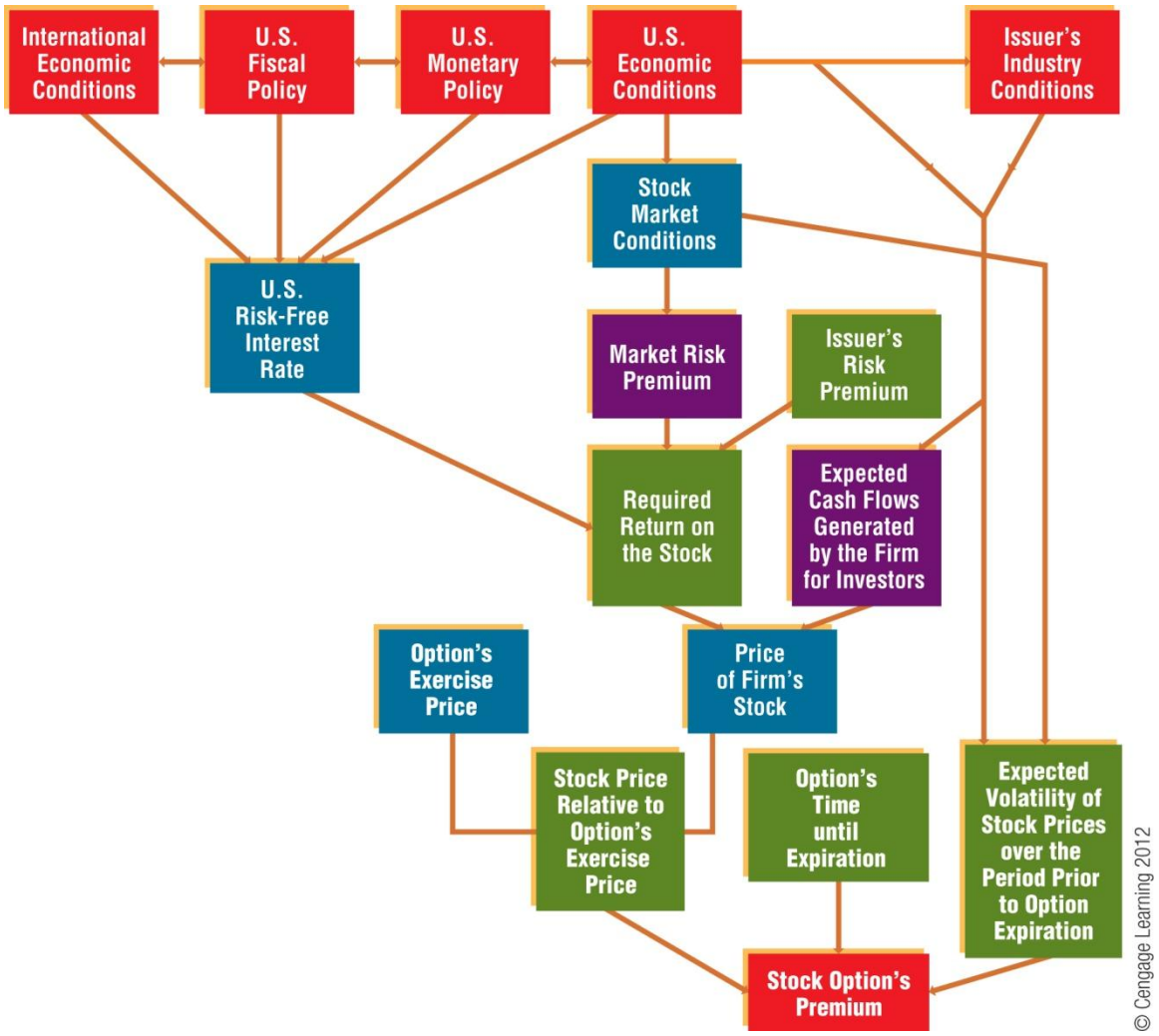
Determinants of Stock Option Premiums

Explaining Changes in Option Premiums

Economic conditions and market conditions can cause abrupt changes in the stock price or in the anticipated volatility of the stock price over the time until option expirations, leading to changes in the stock option's premium.

- **Indicators Monitored by Participants in the Options Market**
  Traders of options tend to monitor economic indicators because economic conditions affect cash flows of firms and thus can affect expected stock valuations and stock option premiums.

Exhibit 14.7 Framework for Explaining Why a Stock Option's Premium Changes over Time



Speculating with Stock Options

Speculating with Call Options

- Call options can be used to speculate on the expectation of an increase in the price of the underlying stock.
- See Exhibits 14.8 – 14.11.

Speculating with Put Options

- Put options can be used to speculate on the expectation of a decrease in the price of the underlying stock.
- See Exhibits 14.12.

Exhibit 14.8 Potential Gains or Losses on a Call Option: Exercise Price = $115, Premium = $4

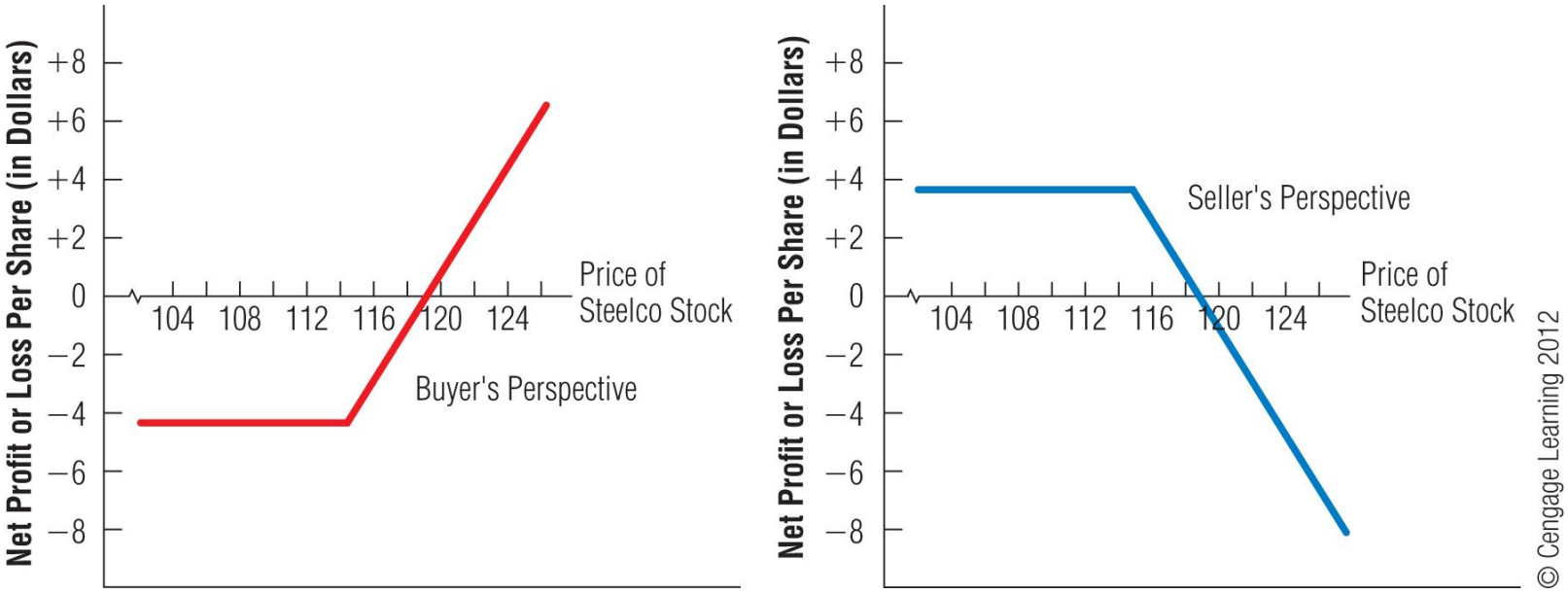


Exhibit 14.9 Potential Gains or Losses for Three Call Options (Buyer's Perspective)

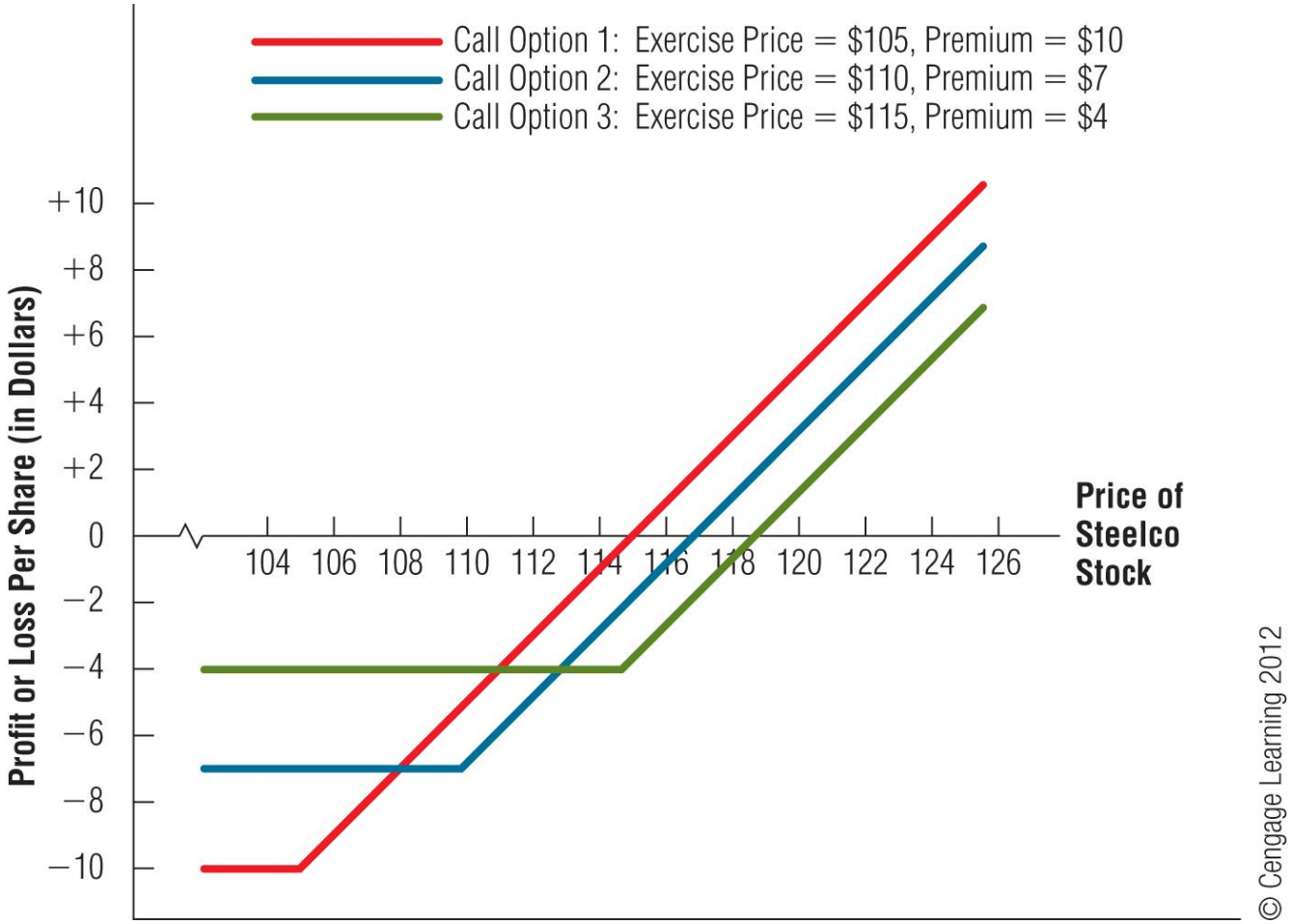


Exhibit 14.10 Potential Returns on Three Different Call Options

	OPTION 1: EXERCISE PRICE = $105 PREMIUM = $10		OPTION 2: EXERCISE PRICE = $110 PREMIUM = $7		OPTION 3: EXERCISE PRICE = $115 PREMIUM = $4	
PRICE OF STEELCO	PROFIT PER UNIT	PERCENTAGE RETURN	PROFIT PER UNIT	PERCENTAGE RETURN	PROFIT PER UNIT	PERCENTAGE RETURN
$104	–$10	–100%	–$7	–100%	–$4	–100%
106	–9	–90	–7	–100	–4	–100
108	–7	–70	–7	–100	–4	–100
110	–5	–50	–7	–100	–4	–100
112	–3	–30	–5	–71	–4	–100
114	–1	–10	–3	–43	–4	–100
116	1	10	–1	–14	–3	–75
118	3	30	1	14	–1	–25
120	5	50	3	43	1	25
122	7	70	5	71	3	75
124	9	90	7	100	5	125
126	11	110	9	129	7	175

Exhibit 14.11 Potential Returns for Three Call Options (Buyer's Perspective)

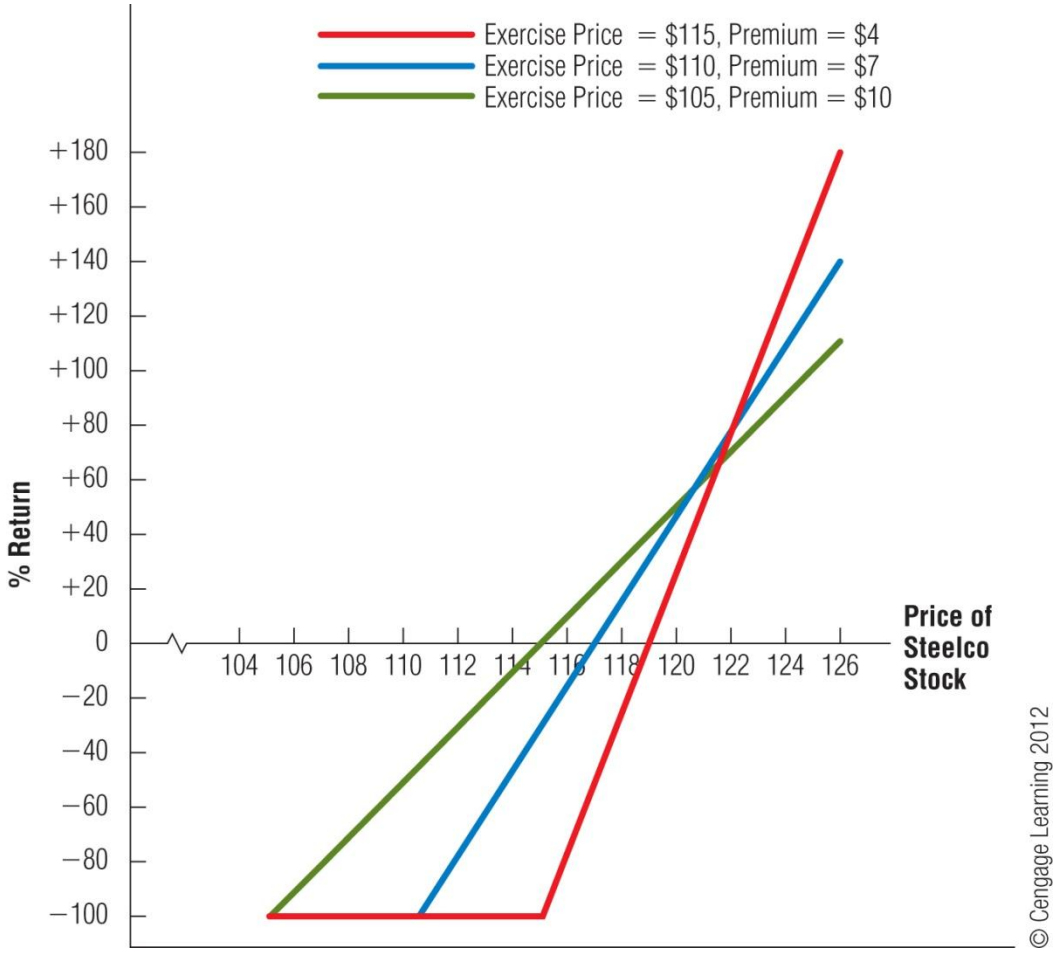
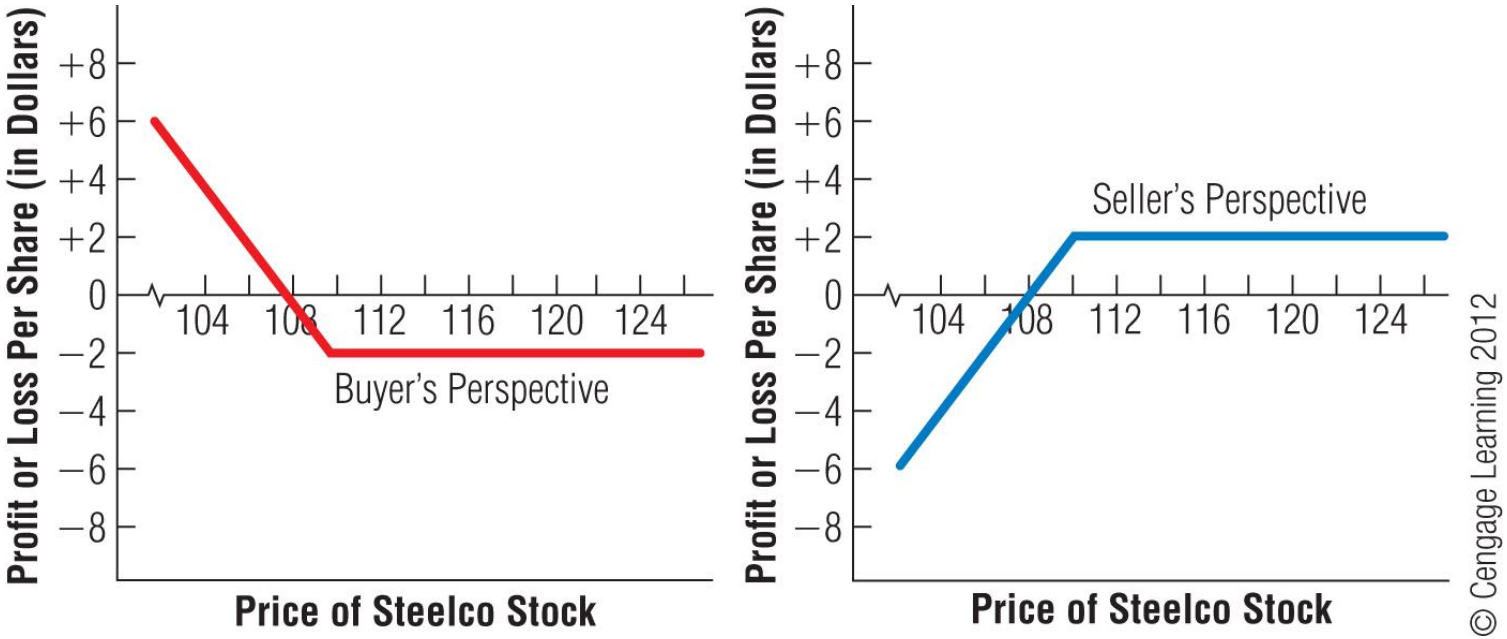


Exhibit 14.12 Potential Gains or Losses on a Put Option: Exercise Price = $110, Premium = $2



Speculating with Stock Options

Excessive Risk from Speculation

- Firms should closely monitor the trading of derivative contracts by their employees to ensure that derivatives are being used within the firm's guidelines.
- Firms should separate the reporting function from the trading function so that traders cannot conceal trading losses.
- When firms receive margin calls on derivative positions, they should recognize that there may be potential losses on their derivative instruments and should closely evaluate those positions.

Hedging with Stock Options

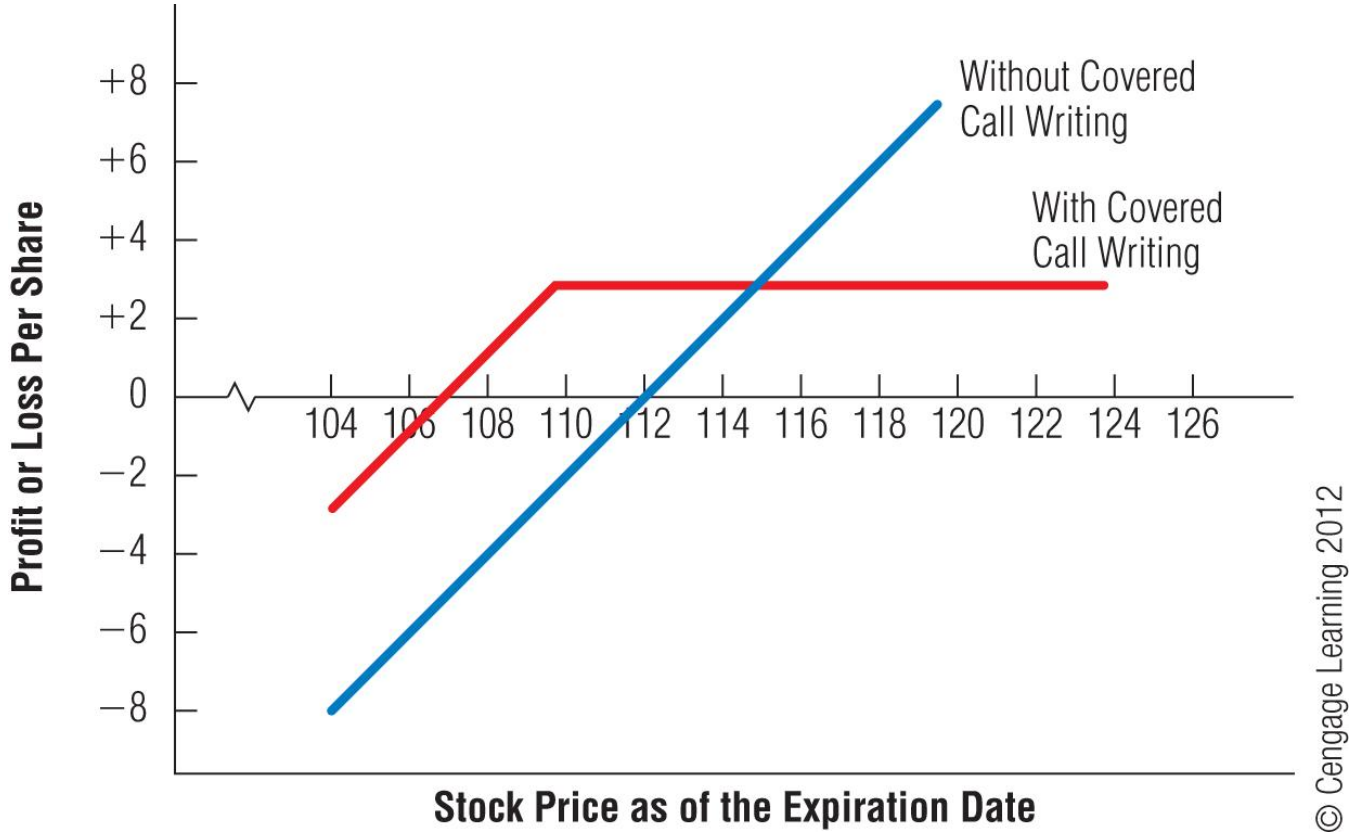
Hedging with Covered Call Options

- Call options on a stock can be used to hedge a position in that stock.
- When the stock declines in value, the premium received from selling the call partially offsets the losses incurred on the stock.
- When the stock increases in value, the call will be exercised and the stock will be sold to the purchaser of the call option.

Exhibit 14.13a Risk-Return Trade-off from Covered Call Writing

EXPLANATION OF PROFIT PER SHARE FROM COVERED CALL WRITING							
MARKET PRICE OF STEELCO AS OF THE EXPIRATION DATE	PRICE AT WHICH PORTLAND PENSION FUND SELLS STEELCO STOCK		PREMIUM RECEIVED FROM WRITING THE CALL OPTION		PRICE PAID FOR STEELCO STOCK		PROFIT OR LOSS PER SHARE
$104	$104	+	$5	–	$112	=	–$3
105	105	+	5	–	112	=	–2
106	106	+	5	–	112	=	–1
107	107	+	5	–	112	=	0
108	108	+	5	–	112	=	1
109	109	+	5	–	112	=	2
110	110	+	5	–	112	=	3
111	110	+	5	–	112	=	3
112	110	+	5	–	112	=	3
113	110	+	5	–	112	=	3
114	110	+	5	–	112	=	3
115	110	+	5	–	112	=	3
116	110	+	5	–	112	=	3
117	110	+	5	–	112	=	3
118	110	+	5	–	112	=	3
119	110	+	5	–	112	=	3
120	110	+	5	–	112	=	3

Exhibit 14.13b Risk-Return Trade-off from Covered Call Writing



Hedging with Stock Options

Hedging with Put Options

- Put options are used to hedge when portfolio managers are concerned about a temporary decline in a stock's value.
- **Hedging with LEAPs**
  - Long-term equity anticipations (LEAPs) are options that have longer terms to expiration, usually between two and three years from the initial listing date.
  - These options are available for some large capitalization stocks, and they may be a more effective hedge over a longer term period than using options with shorter terms to expiration.

Options on ETFs and Stock Indexes

- Options are also traded on exchange-traded funds (ETFs) and stock indexes.
- A **stock index option** provides the right to trade a specified stock index at a specified price by a specified expiration date.
- Call options on stock indexes allow the right to purchase the index, and put options on stock indexes allow the right to sell the index.
- Options on indexes have become popular for speculating on general movements in the stock market.

Exhibit 14.14 Sampling of ETFs and Indexes on Which Options Are Traded

SAMPLING OF ETFs ON WHICH OPTIONS ARE TRADED	
iShares Nasdaq Biotechnology	iShares Russell 1000 Growth Index Fund
iShares Goldman Sachs Technology Index	Energy Select Sector SPDR
iShares Goldman Sachs Software Index	Financial Select Sector SPDR
iShares Russell 1000 Index Fund	Utilities Select Sector SPDR
iShares Russell 1000 Value Index Fund	Health Care Select Sector SPDR
SAMPLING OF INDEXES ON WHICH OPTIONS ARE TRADED	
Asia 25 Index	S&P SmallCap 600 Index
Euro 25 Index	Nasdaq 100 Index
Mexico Index	Russell 1000 Index
Dow Jones Industrial Average	Russell 1000 Value Index
Dow Jones Transportation Average	Russell 1000 Growth Index
Dow Jones Utilities Average	Russell Midcap Index
S&P 100 Index	Goldman Sachs Internet Index
S&P 500 Index	Goldman Sachs Software Index
Morgan Stanley Biotechnology Index	

Options on ETFs and Stock Indexes

Hedging with Stock Index Options

Financial institutions and other firms commonly take positions in options on ETFs or indexes to hedge against market or sector conditions that would adversely affect their asset portfolio or cash flows.

- **Hedging with Long-Term Stock Index Options** – LEAPs are used by option market participants who want options with longer terms until expiration.

Dynamic Asset Allocation with Stock Index Options

Dynamic asset allocation involves switching between risky and low-risk investment positions in response to changing expectations. Some portfolio managers use stock index options as a tool for dynamic asset allocation.

Options on ETFs and Stock Indexes

Using Index Options to Measure the Market's Risk

- A stock index's implied volatility can be derived from information about options on that stock index.
- The same factors that affect the option premium on a stock affect the option premium on an index.

Options on Futures Contracts

- In recent years, the concept of options has been applied to futures contracts to create options on futures contracts (sometimes referred to as “futures options”).
- An option on a particular futures contract gives its owner the right (but not an obligation) to purchase or sell that futures contract for a specified price within a specified period of time.
- Options are available on stock index futures.
- Options on indexes have become popular for speculating on general movements in the stock market.
- Options are also available on interest rate futures, such as Treasury note futures or Treasury bond futures.

Options on Futures Contracts

Speculating with Options on Futures

Speculators who anticipate a change in interest rates should also expect a change in bond prices.

- **Speculation Based on an Expected Decline in Interest Rates**
  If speculators expect a decline in interest rates, they may consider purchasing a call option on Treasury bond futures.

- **Speculation Based on an Expected Increase in Interest Rates**
  If speculators expect interest rates to increase, they can benefit from purchasing a put option on Treasury bond futures.

Options on Futures Contracts

Hedging with Options on Interest Rate Futures

Financial institutions commonly hedge their bond or mortgage portfolios with options on interest rate futures contracts

Hedging with Options on Stock Index Futures

- **Determining the Degree of the Hedge with Options on Stock Index Futures -** A higher premium must be paid to purchase put options with a higher strike price.
- **Selling Call Options to Cover the Cost of Put Options** – fees can be generated by selling call options to help cover the cost of purchasing put options.

Exhibit 14.15 Results from Hedging with Put Options on Treasury Bond Futures

	SCENARIO 1: • INTEREST RATES RISE • T-BOND FUTURES PRICE DECLINES TO 91–00	SCENARIO 2: • INTEREST RATES DECLINE • T-BOND FUTURES PRICE INCREASES TO 104–00
Effect on Emory's spread	Spread is reduced.	Spread is increased, but mortgage prepayments may occur.
Effect on T-bond futures price	Futures price decreases.	Futures price increases.
Decision on exercising the put option	Exercise put option.	Do not exercise put option.
Selling price of T-bond futures	$98,000	Not sold
– Purchase price of T-bond futures	–$91,000	Not purchased
– Price paid for put option	–$ 2,000	– $2,000
= Net gain per option	$ 5,000	– $2,000

Options as Executive Compensation

Limitations of Option Compensation

- Many option compensation programs do not account for general market conditions.
- Executives with substantial options may be tempted to manipulate the stock's price upward in the short term, even though doing so adversely affects the stock price in the long term.
- **Backdating Options -** In the late 1990s and early 2000s, some firms allowed their CEOs to backdate options they had already been granted to an earlier period when the stock price was lower. In 2006, firms that allowed backdating terminated the practice.

Globalization of Option Markets

Currency Options Contracts

- A **currency call option** provides the right to purchase a specified currency for a specified price within a specified period of time.
  - Speculators purchase call options on currencies that they expect to strengthen against the dollar.
- A **currency put option** provides the right to sell a specified currency for a specified price within a specified period of time.
  - Speculators purchase put options on currencies they expect to weaken against the dollar.
- For every buyer of a currency call or put option, there must be a seller (or writer).

SUMMARY

- Stock options are traded on exchanges, just as many stocks are. Orders submitted by a brokerage firm are transmitted to a trading floor, where floor brokers execute the trades. Many trades are executed electronically.
- The premium of a call option is influenced by the characteristics of the option and of the underlying stock that can affect the potential gains. In particular, the premium is higher when the market price of the stock is high relative to the exercise price, when the stock's volatility is greater, and when the term until expiration is longer. For put options, the higher the market price of the stock relative to the exercise price, the lower the premium. The volatility of the underlying stock and the term to expiration are related to the put option premium in the same manner as they are to the call option premium.

SUMMARY (Cont.)

- Speculators purchase call options on stocks whose prices are expected to rise and purchase put options on those expected to decrease.
- Financial institutions can hedge against adverse movements in a stock by selling call options on that stock. Alternatively, they can purchase put options on that stock.
- Financial institutions commonly hedge their stock portfolios by purchasing put options on stock indexes. They may also use stock index options as a tool for dynamic asset allocation, increasing their exposure when they have optimistic views about the stock market and reducing their exposure (buying put options on stock indexes) when they have pessimistic views.

SUMMARY (Cont.)

- Speculators purchase call options on interest rate futures contracts when they expect interest rates to decrease. Financial institutions with large holdings of long-term debt securities hedge against interest rate risk by purchasing put options on interest rate futures. Index options can be used to speculate on movements in stock indexes and require only a small investment. Put options on stock indexes can be purchased to hedge a stock portfolio whose movements are similar to that of the stock index. Options on stock index futures can be used to speculate on movements in the value of the stock index futures contract. Put options on stock index futures can be purchased to hedge portfolios of stocks that move in tandem with the stock index.